WHAT IS CLAIMED IS:

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1. A powerline pulse position modulated communication transmitter comprising:

first and second connections for connecting to an AC powerline;

a chargeable capacitor and a switch in series therewith coupled to said first and second connections for connection in parallel to the powerline;

a digital control integrated circuit;

a zero voltage crossing detector circuit coupled to said first and second connections and to said digital control integrated circuit;

a signal source to actuate said digital control integrated circuit, said digital control integrated circuit being coupled to said switch in series with said capacitor to actuate said switch in one of a predetermined number of a plurality of signal time positions which are time-spaced from the zero crossing and referenced

to the prior zero voltage crossing time in the powerline to discharge said capacitor into the powerline to produce a reference pulse in the powerline at a reference pulse position that is one of said signal time positions;

said digital control integrated circuit being coupled to said switch in series with said capacitor to actuate said switch in one of a said predetermined number of a plurality of signal time positions referenced to said reference pulse position in the powerline to discharge said capacitor into the powerline to produce a data pulse in the powerline at said one of said signal time positions.

2. The powerline pulse position modulated communication transmitter of Claim 1 wherein there is a memory connected to said digital control integrated circuit, said memory being organized to cause said digital control integrated circuit to provide an appropriate series of said signal pulses representing digitally encoded data in response to said signal source to actuate said digital control integrated circuit.

3. The powerline pulse position modulated communication transmitter of Claim 1 wherein said switch in series with said

capacitor is a triac and said triac is connected to be actuated by said transmitting digital control integrated circuit so that said triac permits charging of said capacitor in either polarity of the powerline.

4. The powerline pulse position modulated communication transmitter of Claim 3 wherein said digital control integrated circuit is programmed to actuate said triac to permit charging of said capacitor before signal pulses are desired, in order to have a charge on said capacitor when an actuating pulse actuates said triac to cause a signal pulse in the powerline in a selected signal position.

5. The powerline pulse position modulated communication transmitter of Claim 1 wherein said digital control integrated circuit senses voltage zero crossing in the powerline and emits actuating pulses to said switch to cause one or more reference pulses at timing positions within a predetermined time range within the quiet zone prior to the zero crossing time.

6. The powerline pulse position modulated communication transmitter of Claim 5 wherein said digital control integrated circuit reference pulse positions in the powerline and emits

actuating pulses to said switch to cause one or more data pulses at timing positions within a predetermined time range prior to the zero crossing time.

7. The powerline pulse position modulated communication transmitter of Claim 6 wherein there are at least four signal timing positions prior to zero crossing.

8. The powerline pulse position modulated communication transmitter of Claim 1 wherein said transmitter is one of two controller parts of a system, both said controller parts being connectable to the same powerline for communication therebetween on the powerline, said system comprising two controllers, one acting as said transmitting controller and the other acting as a receiving controller, each said transmitting controller and said receiving controller respectively containing a transmitting digital control integrated circuit and a receiving digital control integrated circuit and each having a zero voltage crossing detector circuit connected thereto, and each said controller having both a transmitting circuit and a receiving circuit so that either said controller can act as a transmitting controller or as a receiving controller, utilizing the same digital control integrated circuit.

9. The powerline pulse position modulated communication system of Claim 8 wherein each said controller has a transmitting circuit comprised of a triac serially connected to a capacitor, said serially connected triac and capacitor being coupled to the powerline, said triac being coupled to be controlled by said digital control integrated circuit; and

each said apparatus having a receive circuit comprising a filter circuit for connection to the powerline, said filter having an output signal line connected to said digital control integrated circuit so that said digital control integrated circuit can detect the timing of a signal pulse with respect to the zero voltage crossing.

10. The powerline pulse position modulated communication system of Claim 9 wherein a memory is connected to said digital control integrated circuit, said memory being programmed to define signal timing positions prior to and spaced from zero crossing so that said transmitting digital control integrated circuit can transmit a one or more reference pulses to the powerline at a selected signal timing positions when acting as a transmitter, and said receiving digital control integrated circuit can determine at which signal timing position a reference signal pulse occurs when

said apparatus is acting as a receiving controller.

11. The powerline pulse position modulated communication system of Claim 9 wherein a memory is connected to said digital control integrated circuit, said memory being programmed to define signal timing positions prior to and spaced from zero crossing so that said transmitting digital control integrated circuit can transmit a one or more data pulses to the powerline at a selected signal timing positions related to the position of said reference pulses in when acting as a transmitter, and said receiving digital control integrated circuit can determine at which signal timing position a data signal pulse occurs relative to said reference pulse when said apparatus is acting as a receiving controller.

12. The powerline pulse position modulated communication system of Claim 1 wherein there is an output driver connected to said digital control integrated circuit, said output driver being connectable to a load so that said output driver can be actuated to energize the load.

13. A powerline pulse position modulated communication system comprising;

a transmitter, first and second connections for connecting said transmitter to an AC powerline, said transmitter having a zero voltage crossing detector connected to said connections, said transmitter having a circuit for producing a pulse;

a signal source connected to said circuit to actuate said transmitter circuit so as to produce a reference pulse in the powerline at reference pulse position which is in one of a plurality of signal time positions and said signal source being actuated to produce a plurality of subsequent pulses in one of said plurality of signal time positions prior to subsequent powerline zero crossings, said subsequent pulses being in selected signal time positions following said reference pulse; and

a receiver having first and second connections for connecting to the same AC powerline, a zero voltage crossing detector in said receiver connected to said first and second connections and a circuit responsive to a reference pulse so that subsequent pulses following the reference pulse in one of the signal time positions can be detected as a function of the time after the reference pulse.

14. A powerline pulse position modulated communication receiver comprising:

first and second connections for connecting to an AC powerline;

a digital control integrated circuit;

a filter circuit coupled to said first and second connections for filtering out power voltages and passing signal pulses, said digital control integrated circuit being connected to said filter circuit to receive signal pulses passed by said filter circuit; and

a zero voltage crossing detector circuit coupled to said first and second connections and to said digital control integrated circuit, said digital control integrated circuit being programmed to compare the timing of the data pulses to the timing of the reference pulses to determine at which one of a plurality of signal timing positions the data pulse is in relative to said reference pulse position, said digital control integrated circuit deriving an encoded digital data number from the position of said

data pulse being located in said one of said plurality of possible said timing positions relative to said reference pulse position.

15. The powerline pulse position modulated communication receiver of Claim 14 wherein said digital control integrated circuit senses signal pulses only at predetermined timing positions within a predetermined time range close to the zero crossing time.

16. The powerline pulse position modulated communication receiver of Claim 15 wherein there are at least four signal timing positions near zero crossing.

17. The powerline pulse position modulated communication receiver of Claim 14 wherein said apparatus is one of two parts of a system, both being connectable to the same powerline for communication therebetween on the powerline, said system comprising two of said apparatus, one acting as a transmitting controller and the other acting as a receiving controller, each said transmitting controller and each said receiving controller respectively containing a digital control integrated circuit which can be programmed to act as a transmitting digital control integrated circuit or a receiving digital control integrated circuit, each said apparatus having a zero voltage crossing detector circuit connected thereto, and each

said apparatus having both a transmitting circuit and a receiving circuit so that either said apparatus can act as a transmitting controller or as a receiving controller, utilizing the same digital control integrated circuit.

18. The powerline pulse position modulated communication receiver of Claim 14 wherein said received signal pulses are received by a circuit incorporating a means for automatically adjusting the receive detection voltage level to provide automatic gain control.

19. A powerline pulse communication apparatus comprising:

a transmitting controller and a receiving controller, said transmitting controller and said receiving controller each having connections for connecting to an alternating current powerline;

said transmitting controller having a zero voltage crossing detector circuit with connections for connecting to the alternating current powerline, said transmitting controller having a digital control integrated circuit therein, said zero voltage crossing detector circuit having an output connected to said digital control integrated circuit;

a command input means connected to said digital control integrated circuit so that when said command input means is actuated said digital control integrated circuit emits a trigger signal;

a serially connected switch and capacitor having connections for coupling to the alternating current power supply so that, when said switch is actuated, said capacitor is charged by the alternating current power supply, said switch being connected to receive a trigger signal from said digital control integrated circuit, said digital control integrated circuit being programmed so

that the trigger signal is within a predetermined time period referenced to a prior zero crossing so that said capacitor is discharged and the signal pulse is added to the powerline within said predetermined time period near to but spaced from a zero crossing.

20. The powerline pulse communication apparatus of Claim 16 wherein said digital control integrated circuit is programmed to turn on said switch at a time to produce a powerline reference pulse at one of a plurality of predetermined temporal positions referenced to the zero voltage crossing point.

21. The powerline pulse communication apparatus of Claim 19 wherein said digital control integrated circuit is programmed to turn on said switch at a time to produce the powerline data pulse at one of a plurality of predetermined temporal positions referenced to the reference pulse position.

22. The powerline pulse communication apparatus of Claim 20 wherein there are at least four temporal positions separately defined by said digital control integrated circuit within the quiet zone within about 1,000 to 500 microseconds of zero voltage crossing.

23. The powerline pulse communication apparatus of Claim 22 wherein each of said temporal positions is approximately 32 microseconds apart.

24. The powerline pulse communication apparatus of Claim 16 wherein said receiving controller also has a zero voltage crossing detector circuit and a receiving digital control integrated circuit, said zero voltage crossing detector circuit being connected to said receiving digital control integrated circuit;

a filter circuit having connections for connection to the household powerlines to receive power signals and communication pulses superimposed therein by a transmitting controller, said filter circuit substantially filtering out all signals except any command pulse in the powerline, said filter circuit being connected to said receiving digital control integrated circuit, said receiving digital control integrated circuit being programmed to be sensitive only to signal pulses within a predetermined time period near to but spaced from zero crossing.

25. The powerline pulse communication apparatus of Claim 24 wherein said receiving digital control integrated circuit is programmed to distinguish between different temporal positions within

said predetermined time period near to but spaced from zero crossing.

26. The powerline pulse communication apparatus of Claim 24 wherein said receiving digital control integrated circuit is programmed to distinguish between different temporal positions within said predetermined time period relative to the position of reference pulses.

27. The powerline pulse communication apparatus of Claim 24 wherein there is an output controller connected to said receiving digital control integrated circuit and said output controller is for connection to the alternating current powerline and to an electrical load, said output controller turning on said load when said receiving digital control integrated circuit detects pulses in said powerline corresponding to a command to energize the load.

28. The powerline pulse communication apparatus of Claim 21 wherein said transmitting digital control integrated circuit is programmed to turn on said switch at a time to produce the powerline pulse within one of several temporal positions near to zero voltage crossing.

29. The powerline pulse communication apparatus of Claim 21 wherein there are at least four possible temporal positions separately defined by said processor within said predetermined time period near to zero crossing.

30. The powerline pulse communication apparatus of Claim 25 wherein each of said temporal positions is approximately 32 microseconds apart.

31. A powerline pulse position modulated communication system comprising:

a transmitter, first and second connections on said transmitter for connecting to an AC powerline, a zero voltage crossing detector connected to said connection, a circuit in said transmitter for producing a pulse to said connections for producing a pulse in the powerline, said circuit receiving zero voltage crossing information from said zero voltage crossing detector and creating a pulse in the powerline in a quiet zone window which is positioned in a predetermined quiet time period near to zero voltage crossing; and

a receiver having first and second connections for connecting to the same AC powerline, a zero voltage crossing detector in said receiver and a circuit in said receiver connected to said first and second connections and to said zero voltage crossing detector, said circuit being conditioned by the zero voltage crossing detector to receive signal pulses from the powerline within the quiet zone which is positioned in a predetermined quiet time period near to zero voltage crossing.

32. The powerline pulse position modulated communication system of Claim 31 wherein said predetermined quiet time period is between about 500 microseconds and 1000 microseconds away from zero voltage crossing.

33. A powerline pulse position modulated communication method for remotely controlling a load, comprising the steps of:

providing a transmitting controller for connection to the powerline;

sensing zero voltage crossing in the powerline;

sensing a load control command and causing the discharging of a capacitor across the powerline and causing the transmission of a reference pulse related to the zero crossing sensing and the load control command;

causing the discharging of a capacitor across the powerline for causing transmission of a series of actuating data pulses related to the position of the reference pulse and the load control command;

sensing at a receiving controller the zero voltage crossing, sensing the reference pulse, sensing the data pulses and determining in which signal timing positions the data pulses are located as compared to position that the reference pulse occurred; and

actuating the load depending upon in which signal timing positions the data pulses occurred.

34. The method of Claim 33 wherein the discharging of the capacitor to place a pulse in the powerline is caused by actuating a triac to become conductive with the triac-actuating signal being produced by a transmitting controller digital control integrated circuit.

35. The method of Claim 34 wherein the timing of the trigger pulses to the triac are related to the zero crossing times by discharging the capacitor at a series of signal positions adjacent zero crossing times which correspond to a command for load control.

36. The method of Claim 34 wherein the timing of the trigger pulses to the triac are related to the reference pulse times by discharging the capacitor at a series of signal positions adjacent zero crossing times which correspond to a command for load control.

37. The method of Claim 33 wherein the signal timing positions are between about 500 and 1000 microseconds away from the zero crossings of the powerline voltage.

38. The method of Claim 36 wherein the signal timing positions are approximately 32 microseconds apart.

39. The method of Claim 33 wherein the receiving controller filters the signal out of the powerline voltage adjacent the zero crossing where the powerline is substantially quiet and delivers a series of sensed signal pulses to the digital control integrated circuit which determines at which signal timing positions said series of pulses occurred.

40. The method of Claim 39 wherein the sensing at which signal timing positions the series of pulses occurred is correlated with a load command to appropriately actuate a load.